Military technology insider

By John Wemekamp

Future Combat Systems to field Network Attached Storage

Armored vehicles, Unmanned Aerial Vehicles (UAVs), helicopters, and combat aircraft are generally self-sufficient in terms of onboard, embedded mission and combat computer systems. In the future, each will become a participant in the digital battlefield with the introduction of network-ready capability applicable to upgraded and new systems such as the Army's Future Combat Systems (FCS). They will become part of a distributed, networked system, just as large commercial enterprise and information technology systems are today. Many common network services will be available for these platforms, and they will contribute to and share in many common databases. Network Attached Storage (NAS) devices, able to survive the rigors of the battlefield environment, will be required in many current and new vehicles and command positions.

Military platforms have been able to operate cooperatively using secure point-to-point data links for many years. However, platforms at the lower echelons generally only get a restricted view of the broader tactical situation fed back to them from the command and control level with a series of engagement instructions. The networked battlefield devolves a potentially complete view of the tactical situation to all levels through shared databases and network services by using a more distributed computing approach. This changes how an individual platform's systems will be architected. In the future, military platforms will still have their own, real-time embedded computing capability for controlling the vehicle and its sensors and weapons. However, they will include much additional network service-oriented capability, allowing them to truly interact in real time with other battlefield participants as well.

The digital battlefield will have shared databases that can be accessed by many different applications. File servers provide this function and may take many forms from large, static server farms through midsized servers located in mobile command posts to individual storage devices located within armored vehicles. As the command structure is so large geographically, there are significant benefits in distributing the locations of file servers in this way. Within a vehicle, a file server offers much faster access through a local onboard Ethernet switch than a remote one. Additionally, one network storage device per vehicle could be allocated as the only physical location for all that vehicle's mission-sensitive and classified data. Such a device could be easily removable, leaving the vehicle in a declassified state in the event of rapid evacuation or when it is left unattended.

Perhaps network file services could be provided by one of an armored vehicle's existing embedded computers; if this is based on VME or a similar COTS technology, it will have at least one SBC at the heart of its configuration. An SBC supports mass memory attachment via SCSI or SATA interfaces for local embedded file system or mission data recorder functionality. With an Ethernet interface, which is again fitted to any contemporary SBC, the embedded computing system could be configured to offer network file services as well. But there would be a trade-off to be made between the level of network traffic anticipated and its impact on the embedded system's application code. In general, where many remote users need to access common files, NAS offers better performance and responsiveness.

As NAS will be located in an armored vehicle that experiences extremes of temperature plus high levels of shock and vibration, it must be extremely rugged to survive the environment. Many suitable form factors exist for implementing a NAS device, but the new VPX-REDI (VITA 48) standard provides the optimum size for use in compact armored vehicles and has the added advantage of being easily removable as a Line Replaceable Module (LRM). The VPX-REDI format enables the NAS to be located in the same racking systems as other VPX-REDI modules, making it an ideal complement to the embedded and network application systems to be fitted to next-generation vehicles.

NAS is now available in VPX-REDI (VITA 48) format for armored vehicle applications, such as the VPX6-511 by Curtiss-Wright Controls Embedded Computing (CWCEC) shown in Figure 1. It is offered with a choice of media, using the 2.5" format to suit different environments, with a choice of either 64 GB solid-state memory or rotating media using sealed or unsealed disk drives. It is a self-contained Linux-based file server with a 1 Gbps Ethernet port. Within the VPX profile, the VPX6-511 supports the addition of a PMC/XMC module that could, for example, be used to add an eight-port Ethernet switch or a high-performance encryption/decryption engine supporting AES-128/256 for network storage of highly classified data. In addition to the embeddable form of NAS in VPX format, it can also be implemented as a stand-alone unit with its own enclosure for installation anywhere within an existing vehicle.

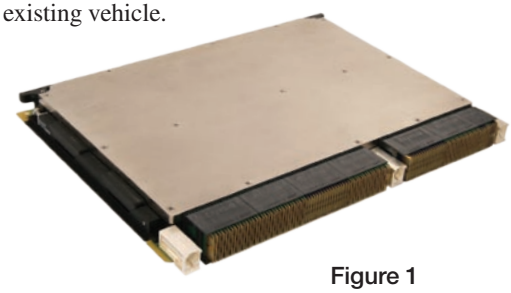

Figure 1

Just as the commercial world has adopted networked services and shared file servers for collaborative working between many physically separated locations, battlefield digitization efforts are headed in the same direction. NAS will be a key element in next-generation systems such as the global information grid and network-ready systems including the Army's FCS. In ruggedized form, NAS will experience widespread deployment in all types of platforms from UAVs to armored vehicles or helicopters in new and upgrade programs as the Army rapidly modernizes its capability.

For more information, e-mail John at john.wemekamp@curtisswright.com.